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Numerical simulation of microlayer formation in nucleate boiling ALEXANDRE GUION, JACOPO BUONGIORNO, Massachusetts Institute of Technology, SHAHRIAR AFKHAMI, New Jersey Institute of Technology, STEPHANE ZALESKI, Sorbonne Universites, UPMC Univ Paris 06, CNRS, UMR 7190, France — Numerical simulations of boiling resolve the macroscopic liquid-vapor interface of the bubble, but resort to subgrid models to account for microscale effects, such as the evaporation of the liquid microlayer underneath the bubble. Realistic time-dependent microlayer evaporation models necessitate initialization of the microlayer profile. In the recent simulations published in the literature [J. Comp. Phys., 300 (2015): 20-52], missing input data on initial microlayer geometry is replaced by estimated values from separate experimental measurements at similar pressure. Yet, the geometry of the initial microlayer not only depends on pressure for a given set of fluids, but also on bubble growth rate and that dependence is not known *a priori*. In this work, the Volume-of-Fluid (VOF) method, implemented in the open-source code Gerris (gfs.sf.net), is used to simulate, with unprecedented accuracy, the dynamics of microlayer formation underneath a growing bubble. A large numerical database is generated, yielding the microlayer thickness during the inertia controlled phase of bubble growth as a function of radial distance from the bubble root, time, contact angle, and capillary number associated with bubble growth. No significant dependence on density or viscosity ratios were found.

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